

SEISMOLOGY.

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[Dated: Weather Bureau, Washington, D. C., Feb. 3, 1920.]

TABLE I.—Noninstrumental earthquake reports, December, 1919.

Day.	Approximate time, Greenwich civil.	Station.	Approximate latitude.	Approximate longitude.	Intensity Rossi-Forel.	Number of shocks.	Duration.	Sounds.	Remarks.	Observer.
CALIFORNIA.										
1919.	<i>H. m.</i>		<i>° ' "</i>	<i>° ' "</i>			<i>Sec.</i>			
Dec. 5	10 34	San Francisco.....	37 48	122 23	4	1		None.....	Felt by many.....	U. S. Weather Bureau. W. R. Springer. F. H. McCullagh. A. J. Berg. Mrs. A. Z. Campbell. Press report.
11	23 29	Santa Cruz.....	36 55	122 00	5	1		do.....	Felt by several.....	
		Los Galos.....	37 12	121 58	4	1		do.....	do.....	
12	5 38	Aguanga.....	33 30	117 00	2	1	2	do.....	Short and sharp.....	
18	7 15	Paso Robles.....	35 40	120 45	3	1		do.....	Felt by several.....	
20	9 30	Santa Rosa.....	38 30	122 45	4	1		do.....	do.....	
OREGON.										
26	6 00	Bullrun.....	45 30	122 12	4			None.....	Men awakened; shocks throughout night.	

CORRIGENDUM.

REVIEW, August, 1919, page 601:

In the record of the quake on August 18, it should have been reported from 17 to 18 hours *ca.* instead of from 5 to 6 hours.

TABLE 2.—Instrumental seismological reports, December, 1919.

(Time used: Mean Greenwich, midnight to midnight. Nomenclature: International.)

[For significance of symbols see REVIEW for January, 1919, p. 59.]

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _E	A _N		
Alabama. <i>Mobile. Spring Hill College. Seismic Observatory. Cyril Ruhlman, S. J.</i>								
Lat., 30° 41' 44" N.; long., 88° 08' 48" W. Elevation, 60 meters.								
Instrument: Wiechert 80 kg.; astatic, horizontal pendulum.								
1919.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Dec. 5...		IP?.....	0 19 22	12	*4,000			N component undamped.
		S?.....	0 20 32					E only a trace.
		L?.....	0 22 46	6	*3,500			
		F.....	0 46 00					
* Trace amplitude.								
Alaska. <i>Sitka. Magnetic Observatory. U. S. Coast and Geodetic Survey. F. P. Ulrich.</i>								
Lat., 57° 03' 00" N.; long., 135° 30' 03" W. Elevation, 15.2 meters.								
Instruments: Two Bosch-Omori, 10 and 12 kg.								
Instrumental constants. $\begin{cases} E & T_0 \\ N & 10 & 16 \end{cases}$								
1919.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Dec. 15..		eP _E	1 10 24					Felt at Juneau.
		eP _N	1 10 25					
		M _E	1 11 02	5	10	10		
		F _E	1 12 23					
		F _N	1 11 31					

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _E	A _N		
Arizona. <i>Tucson. Magnetic Observatory. U. S. Coast and Geodetic Survey. Wm. H. Cullum.</i>								
Lat., 32° 14' 45" N.; long., 110° 50' 06" W. Elevation, 769.6 meters.								
Instruments: Two Bosch-Omori, 10 and 12 kg.								
Instrumental constants. $\begin{cases} E & T_0 \\ N & 10 & 13 \end{cases}$								
1919.			<i>H. m. s.</i>	<i>Sec.</i>	μ	μ	<i>Km.</i>	
Dec. 18.		eP _E	1 24 43					
		eP _N	1 24 40	3				
		L _E	1 29 13					
		L _N	1 29 09					
		M _E	1 29 44		20			
		M _N	1 29 40	4		30		
		C _E	1 23	5				
		C _N	1 31					
		F _E	1 38					
		F _N	1 33					
California. <i>Berkeley. University of California.</i>								
(See Bulletin of the Seismographic Stations, University of California.)								
California. <i>Mount Hamilton. Lick Observatory.</i>								
(See Bulletin of the Seismographic Stations, University of California.)								
California. <i>Point Loma. Raja Yoga Academy. F. J. Dick.</i>								
(Report for December, 1919, not received.)								

TABLE 2.—Instrumental seismological reports, December, 1919.—Continued.

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _m	A _N		

California. *Santa Clara. University of Santa Clara.* J. S. Ricard, S. J.
(See Record of the Seismographic Station. University of Santa Clara.)

Colorado. *Denver. Sacred Heart College. Earthquake Station.* A. W. Forstall, S. J.

Lat., 39° 40' 35" N.; long., 104° 58' 54" W. Elevation, 1,655 meters.
Instrument: Wiechert, 80 kg., astatic, horizontal pendulum.

1919.		H. m. s.	Sec.	μ	μ	Km.	
Dec. 2	L _m	14 44					Very distinct sinusoidal on E-W. Recurs during day.
	F _m	17 30					
12	L _m	14 20					Distinct but irregular wavelets at intervals.
	F _m	16 50					
18	P _m	1 29	4	*2,500			Second P. not discernible.
	M _m	1 31					
	C _m	1 35					
	F _m	1 38					
22	L _m	2 08				Very small but distinct sinusoidal recurring at intervals.	
	F _m	3 50					
23						Activity at intervals during day.	
24						Do	

* Trace amplitude.

District of Columbia. *Washington. U. S. Weather Bureau.*

Lat., 38° 54' 12" N.; long., 77° 03' 03" W. Elevation, 21 meters.

Instrument: Marvin (vertical pendulum), undamped. Mechanical registration.

Instrumental constants... $V \frac{T_0}{T_0} = 110 \ 6.4$

1919.		H. m. s.	Sec.	μ	μ	Km.
Dec. 5	P	0 21 25				3,030
	S	0 26 05				
	F	0 45 ca.				
20	eL	21 35	30			
	L	21 45	20			
	L	21 50	16			
	F	22 20 ca.				

District of Columbia. *Washington. Georgetown University.*
F. A. Tondorf, S. J.

Lat., 38° 54' 25" N.; long., 77° 04' 24" W. Elevation, 42.4 meters. Subsoil: Decayed diorite.

Instruments: Wiechert 200 kg. astatic horizontal pendulum, 80 kg. vertical.

Instrumental constants... $\begin{matrix} E & V & T_0 & e \\ & 165 & 5.4 & 0 \\ N & 143 & 5.2 & 0 \\ Z & 80 & 3.0 & 0 \end{matrix}$

1919.		H. m. s.	Sec.	μ	μ	Km.	
Dec. 5	eP	0 21 23					
	eS	0 26 00					
	eL	0 28 48					
	F	0 49					
14	L	2 15 to 2 34	0				Very heavy micros.
	F	2 42					
18	e	1 26 37					Do.
	S?	1 32 00					
	F	1 50					
20	eL	21 35 00					
	L	21 41 16	16				
	F	22 14					

Date.	Character.	Phase.	Time.	Period T.	Amplitude.		Distance.	Remarks.
					A _m	A _N		

Hawaii. *Honolulu. Magnetic Observatory.* U. S. Coast and Geodetic Survey. Frank Neumann.

Lat., 21° 19' 12" N.; long., 158° 03' 48" W. Elevation, 15.2 meters.

Instrument: Milne seismograph of the Seismological Committee of the British Association.

Instrumental constant... $\frac{T_0}{18.4} = \text{Sensitivity, } 0.40''$.

1919.		H. m. s.	Sec.	μ	μ	Km.	
Dec. 11	P	23 29 54	20				
	eL	23 31 30					
	M	23 33 06	18	*700			
	F	23 36 36					
12	P	4 00 48	14				Phases not consistent.
	S?	4 04 24	20				
	eL	4 09 54					
	M	4 16 06	18	*100			
14	P	1 26 18	17				
	S	1 33 48	17				
	eL	1 38 30					
	M	1 51 06	15	*300			
17	P	23 55 54					
	L	24 00 09					
	M	24 04 24	16	*300			
	F	24 34	20				
20	eP	20 01 12	19				P confused by air tremors.
	L	20 16 54					
	M	20 23 30	15	*300			
	C	20 34	20				
20	eP	20 58 48	17				P confused by end of previous quake.
	L	31 22 30					
	M	21 27 30	15	*1,000			
	F	21 36	18				

* Trace amplitude.

Illinois. *Chicago. University of Chicago.* U. S. Weather Bureau.

Lat., 41° 47' N.; long., 87° 37' W. Elevation, 180.1 meters.

Instruments: Two Milne-Shaw horizontal pendulums, 0.45 kg.

Instrumental constants... $\begin{matrix} V & T_0 & e \\ E & 150 & 12 & 20:1 & 1'' \text{ arc tilt} = 26.6 \text{ mm.} \\ N & 150 & 8 & 20:1 & 1'' \text{ arc tilt} = 13.2 \text{ mm.} \end{matrix}$

1919.		H. m. s.	Sec.	μ	μ	Km.		
Dec. 5	P	0 22 10				2,440		
	S	0 26 09						
	L	0 30	30					
	F	1 ca.						
14	eL	2						
	L	2 13	18					
	L	2 16	15					
	F	2 50 ca.						
18	P	1 28 06						
	S	1 30 30						
	L?	1 33 00						
	F	2 ca.						
20	eL	20 20						
	L	20 35	26					
	L	20 44	15					
	F							
20	eL	21 17	ca26				Lost in micros.	
	L	21 20 30	ca30					
	L	21 35	28					
	L	21 40	24					
	L	21 47	15					
	F	23 10 ca.						
26	eL?	17					Do.	
	L	17 09 30	22					
	L	17 14	16					
	F	17 40 ca.						
27	eL	21 13	18					
	L	21 21	16					
	F	22 ca.						

TABLE 2.—Instrumental seismological reports, December, 1919—Con.

Date.	Char. acter.	Time.	Period. T.	Amplitude.		Dis- tance.	Remarks.
				A ₁	A ₂		
Canada. Victoria, B. C. Dominion Meteorological Service.							
Lat., 48° 24' N.; long., 123° 19' W. Elevation, 67.7 meters. Subsoil: Rock.							
Instrument: Wiechert, vertical; Milne horizontal pendulum, North: in the meridian.							
Instrumental constant. $\frac{T_0}{18}$. Pillar deviation, 1 mm. swing of boom = 0.54".							
1919. Dec. 3.	P	2 26 26				215	Off. Pt. Estevan. Felt there and at Alert Bay Wire- less Station.
	L	2 28 55					
	M	2 27 25			*100		
	F	2 30 21					
VERTICAL.							
	P	2 24 55	2.5				
	L	2 25 35	8				
	M	2 25 45	3		a		
	F	2 31 30					
5	P	0 32 28					
	S	0 37 03					
	L	0 41 29					
	M	0 43 56			*200	2,700	
	F	0 55 44					
12	P	4 22 16					
	M	4 26 42			*200		
	F	4 35 03					
14	P	1 32 02					
	S	1 33 24					
	M	2 00 04			*200		
	F	2 29 05					
14	M	3 34 20			*50		
15	P?	20 16 59					
	M	20 18 57			*200		
	F	20 25 50					
18	P?	0 12 21					
	M	0 20 13			*50		
	F	0 25 08					
18	P	1 34 58					
	L	1 38 54					
	M	1 41 21			*300		
	F	1 49 43					
20	P	21 00 50					Marked micros from 20h 23m to 20h 44m.
	S	21 06 18					
	L	21 15 43					
	M	21 29 36			*500	3,670	
	F	22 43 28					
21	M	18 55 28			*50		May not be seismic.
23	P	0 23 38					
	M	0 32 59			*100		
	F	0 41 20					
26	P	16 56 58					
	M	17 01 24			*100		
	F	17 09 51					

* Trace amplitude.

SEISMOLOGICAL DISPATCHES.¹

London, December 3, 1919.

A serious earthquake occurred in western Asia Minor on Thursday, seven villages in the district of Soma and Balikeari being destroyed, according to advices received here from Constantinople. Many persons were killed and injured, it is stated.—Associated Press.

Juneau, Alaska, December 14, 1919.

Juneau and vicinity were rocked at 4:10 p. m. to-day by one of the heaviest earthquakes experienced here in years. Buildings were badly shaken, but no material

¹ Reported by the organization indicated and collected by the seismological station at Georgetown University, Washington, D. C.

damage has been reported. It is believed the shocks centered about the Katmai Volcano, near Kodiak, and that the volcano may be in eruption again.—Associated Press.

TABLE 3.—Late reports. (Instrumental.)

Date.	Char- acter.	Phase.	Time.	Period T.	Amplitude.		Dis- tance.	Remarks.
					A ₁	A ₂		
Hawaii. Honolulu. Magnetic Observatory. U. S. Coast and Geodetic Survey. Frank Neumann.								
Lat., 21° 19' 13" N.; long., 155° 03' 48" W. Elevation, 15.2 meters.								
Instrument: Milne seismograph of the Seismological Committee of the British Associa- tion.								
Instrumental constant. $\frac{T_0}{18.4}$ Sensitiveness 0.40 arc tilt-1 mm.								
1919. Nov. 5	P		20 36 00		16			
	eL		20 43 06					
	M		20 47 42		15	*100		
	C		20 54 24					
	F		20 58 ..					
6	L		17 32 00					
	M		17 44 ..			*100		
	F		17 44 ..					
18	eP		4 23 54					Hourly time breaks missing: time in- terpolated for an interval of 25 hours.
	L		4 32 24		22			
	M		4 50 18		17	*300		
	C		4 55 ..					
	F		5 10 ..		19			
18	P		23 00 24		15			
	L		23 05 00					
	M		23 11 00		20	*200		
	C		23 19 ..		18			
	F		23 26 ..					
20	iP		14 19 48		19			Very sharply de- fined.
	S		14 27 18					
	SR ₁		14 32 00		14			
	L		14 38 43					
	M		14 42 42		15	*2,000		
	C		14 48 ..		16			
	F		15 36 ..		20			
23	eP		6 17 42		18			Phases indefinite.
	eS		6 23 48					
	L		6 30 30					
	M		6 35 00		17	*700		
	C		6 42 ..		19			
	F		7 25 ..		17			
26	e		8 30 30					
	M		8 31 00			*50		
	F		8 34 ..					

* Trace amplitude.

Porto Rico. Vieques. Magnetic Observatory. U. S. Coast and Geodetic Survey. W. M. Hill.

Lat., 19° 09' N.; Long., 65° 27' W. Elevation, 19.8 meters.

Instruments: Two Bosch-Omorl.

Instrumental constants. $\left\{ \begin{array}{l} E \\ N \end{array} \right. \begin{array}{l} V \\ 10 \\ 10 \end{array} \begin{array}{l} T_0 \\ 17 \\ 19 \end{array}$

1919. Nov. 6	P	H. m. s.	Sec.	μ	μ	Km.	Remarks.
	P	7 15 00					Beginning of a series of waves of small ampli- tude and period about 1s.
	S ₁ ?	7 16 23					
	L	7 17 27					
	L ₂	7 17 19					
	M	7 18 05	14	*60			
	M ₂	7 18 02			*50		
	C	7 20 ..					
	F	7 24 ..					
8	eP	3 44 39					Felt in several in Porto Rico.
	eP ₂	3 45 18			*10		
	F	3 47 ..					
22	P	1 09 02					
	P ₂	1 08 42					
	M	1 09 43			*20		
	M ₂	1 10 06	5		*20		
	F	1 14 ..					

* Trace amplitude.